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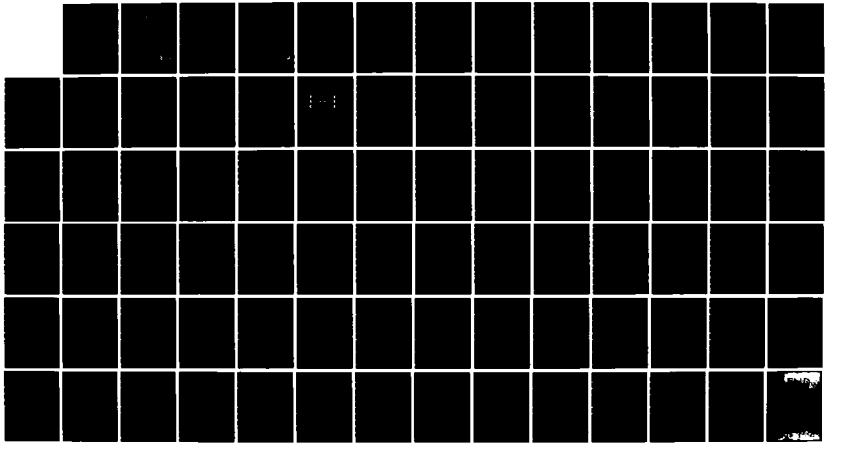

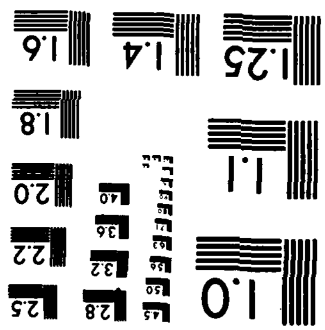
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NEURO-LINGUISTIC PROGRAMMING: EYE MOVEMENTS

.S INDICATORS OF REPRESENTATIONAL SYSTEMS

THESIS

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AFIT/GLM/LSM/84S-48

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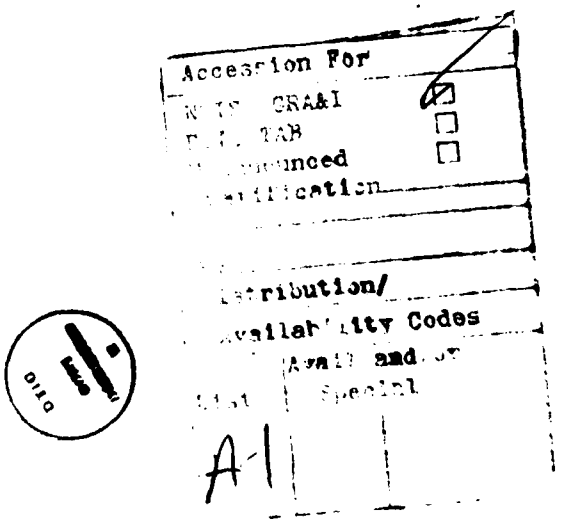

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THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Management

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Bill Moore
Gregg Powell

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Abstract

The experiment documented in this thesis investigated the eye movement hypothesis of the Neuro-Linguistic Programming model by testing the initial and dominant eye movements of forty-three male, right handed subjects against two methods of determining representational systems: the categorization of verbal responses and the selection of written descriptors, both in response to stimulus cues. Chi squared contingency tables were used to test dependency.

Neuro-Linguistic Programming was developed by Richard Bandler and John Grinder. It is a model of human communications and behavior which claims that people organize and access information using representational systems. These systems are based on sensory modes, primarily auditory, visual, and kinesthetic. According to the model, specific eye movements are associated with, and are indicators of, these representational systems.

In this study, verbal responses were found to be dependent upon dominant eye movement, statistically significant to the .10 level (X^2 = 8.5385, 4d.f.). No correlation was found between dominant eye movement and the selection of written descriptors or between initial eye movements and either verbal response or descriptor selection.

The results of this study lend some credibility to the assertion that eye movements are indicators of representational systems, but suggest caution in the use of the eye movement method alone because of the lack of overwhelming agreement between the variables tested. Also, the fact that initial eye movements did not reach statistical significance

as indicators in either test while dominant eye movements did reach significance, revealed an unanticipated complexity in the assessment of eye movements. Finally, the need for sophisticated audio-visual equipment to properly discern eye movements, particularly initial ones, questions the ability of facilitators to discriminate eye movements consistently and accurately in a practical setting.

NEURO-LINGUISTIC PROGRAMMING: EYE MOVEMENTS AS INDICATORS OF REPRESENTATIONAL SYSTEMS

I. Introduction

The fundamental objective of the communication process is to transmit an exact message from sender to receiver. When the process involves interpersonal communication, that message is often distorted by subjective influences such as attitude, interpretation, and semantics. Sophisticated technology has enhanced speed and precision in electronic and mechanical communication systems. Effective interpersonal communication systems, however, continue to depend on theory more than on structure, and subjective influences still create difficulty in establishing clear-cut techniques for the exchange of information.

Effective communication is essential anywhere people interact. In dialogue it can form the basis for trust and rapport. In an organizational setting, where the coordination of human effort is the key to task accomplishment, effective communication facilitates understanding of expectations and limitations.

Background

Noted practitioners in the field of communication, psychiatrist Milton Erickson and therapists Virginia Satir and Fritz Perls, succeeded largely through excellent rapport with clients. By studying these masters, John Grinder, a linguist, and Richard Bandler, a Gestalt therapist, saw communication and therapy as having a defined structure that could be transformed into a working model. As they point out, people

use language to represent and communicate experience, that is, to model the world. Bandler and Grinder used transformational grammar, which is a subset of linguistics, to develop a model of our language. Since it is a model of a model of the world, they called it a Meta-model (2:24). By comparison, a thesis is a literary model or representation of actual research experience, while the thesis abstract is in turn a model of the written work. Development of the Meta-model was the beginning of Neuro-Linguistic Programming (NLP), a relatively new area for research into human communications and behavior (8:69).

Neuro-Linguistic Programming is a communication model founded in the disciplines of cybernetics, philosophy, neurology, psychology, and linguistics. Neurology and linguistics give the first two words of the NLP title (14:69). The model is based in the assumption that there is a correlation between the human sensory system and the individual representational systems people use to categorize human experience. According to theory, each person encodes experience into an individualized representational system which employs the sensory mode that the individual most often uses to model the world; these modes are principally visual, auditory, and kinesthetic (10:327).

Representational Systems

A central concept behind the model is that each person is more sensitive to one primary representational system (PRS) than to the others. That is, each person uses one system to make the finest distinctions (8:69). If the facilitator (therapist, counselor, teacher, etc.) communicates in the subject's primary representational system (PRS), rapport is established and interpersonal communication greatly enhanced.

Once the facilitator matches the client's primary representational system (PRS), the rest of the model can be applied, with the possibility of quickly and even dramatically modifying behavior.

People use all representational systems, but generally favor one over the others. Limiting oneself to a single representational system can limit one's model of the world and can distort or screen out communications from others who are using another system. This mismatching results in confusion, frustration, and possibly inter-personal conflict.

Mismatching

Mismatching is a particular problem in situations where the relationship between the parties is not equal, as in the case of therapist-client, teacher-pupil, parent-child, or supervisor-worker. (We will say facilitator-client to describe this superior-subordinate relationship). The failure to communicate may simply result from a mismatch in representational systems, but the facilitator might unwittingly interpret the problem as resistance, lack of intelligence, or unwillingness on the part of the client. This misinterpretation is decidedly to the detriment of the client who often cannot go elsewhere for the help needed.

According to Bandler and Grinder, this failure to communicate is the case with many school children who experience learning problems. A mismatch between the teacher and the student prevents the transfer of necessary information. This communication failure may explain how a student can be labelled "educationally handicapped" in a certain subject one year and do very well in the same subject the next year; it may explain how a student does very well in grammar, yet at the same time

poorly in a related subject, such as literature, working with a different teacher (1:40).

In The Structure of Magic II, Bandler and Grinder described a therapy session they observed during one of their workshops:

> Client (visual): "My husband just doesn't see me as a valuable person."
> Counselor (kinesthetic): "How do you feel about that?"
> Client (visual): "What?"
> Counselor (kinesthetic): "How do you feel about your husband not feeling that you're a person?"
> Client (visual): "That's a hard question to answer. I just don't know."

Eventually the therapist came out and said to the authors: "I feel frustrated, this woman is just giving me a hard time. She resists everything I do" (9:16-17).

Neither party is at fault; they are simply not communicating with each other. Of course it is unrealistic to expect the client to adapt. The Meta-model suggests the facilitator can adjust and match systems, a behavior which will enhance communication and allow the other portions of the model to be applied.

Methods of Primary Representational System (PRS) Identification

It is therefore critical for the facilitator to be able to recognize the PRS being used by the subject so it can be matched accordingly. The facilitator can supposedly identify the representational system in three ways: First, he can simply ask the client to identify from consciousness which system he is in. Second, he can listen to the verbal predicates (verbs, adverbs, and adjective phrases) the client uses and classify them as visual, auditory, or kinesthetic. Third, he can monitor the eye movements of the client (10:327).

The first method, asking clients to help identify the system, has obvious drawbacks. It requires clients to make observations they may not be able to distinguish or verbalize. Also, since people can switch systems, the facilitator must be able to track the system currently in use (11:177). Finally, asking the client to identify the system consciously ignores the wealth of information contained in the unconscious portion of the communication process. Bandler and Grinder claim that the conscious understanding of the client is irrelevant as long as the desired results can be obtained (1:77). In their test of this method, Gumm, Walker, and Day found no significant results (10:329).

Listening for verbal predicates (sometimes called process words) to determine PRS is a method widely used by Neuro-Linguistic Programming practitioners. According to Lankton, when people use predicates (adjectives, adverbs, and verbs) that are related to the senses, they are not using these predicates metaphorically, but literally.

> [I]f someone tells you they "see what you mean," they are literally making meaning of what you say by accessing pictures internally. If someone else reports that something "sounded good" or "came through as clear as a bell" that person is literally informing you that he is representing information to himself auditorily (13:18).

Figure 1-1 lists typical sensory related predicates.

Testing the use of verbal predicates to determine PRS has had mixed results. Dowd and Pety investigated the relationship to perceived social influence of the counselor and satisfaction of the client and did not find significant effects (5:207). Falzett matched predicates to measure perceived trustworthiness in a counseling analogue and found predicates to be unreliable as predictors of internal PRS (7:308). Hammer tracked and matched perceptual predicates in a counseling analogue and found

Typical Sensory Related Predicates

Visual	Auditory	Kinesthetic
focus	listen	feel
see	yell	firm
clear	talk	touch
bright	hear	pressure
picture	harmony	tense
perspective	noisy	concrete
show	discuss	hurt
hazy	call	touchy
colorful	loud	irritated
pretty	shout	clumsy
peak	told	pushy
glimpse	mellifluous	relaxed

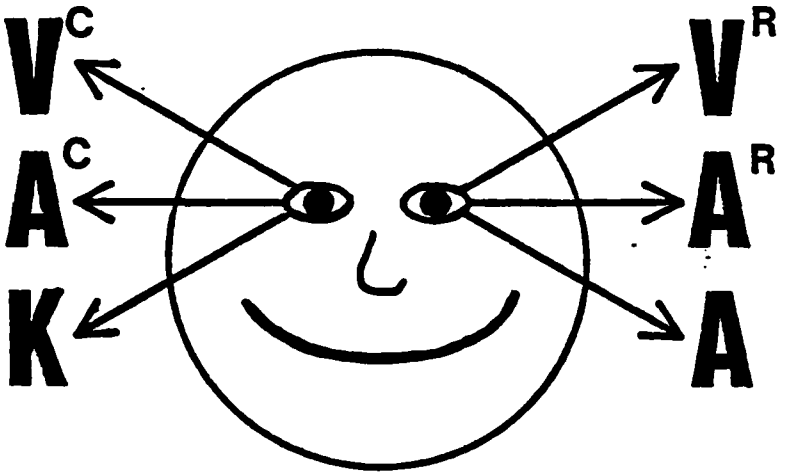
Figure 1-1. Typical Sensory Related Predicates (12:19)

significant perceived empathy, but did not attempt to determine the PRS of the subject (11:177).

The third method, detection of eye movements (also called visual accessing cues), is the focus of this study. It is based on the theory that eye scanning patterns relate to the internal processing a person uses to bring material into consciousness (12:451). Bandler and Grinder (1) describe the visual accessing cues that apply to a "normally organized" right-handed person. For left-handers the visual accessing cues are reversed left to right (see Figure 1-2).

A person who processes information visually uses constructed or eidetic images. A constructed image is generally a picture the individual has not seen before and is assembling. The corresponding eye movement is up and to the right. An eidetic image is something the person has seen before and is remembering. The depicted eye movement is up and to the left. Eyes defocused indicate a visual image of either type.

Visual accessing cues for a "normally organized" right-handed person.



V^C Visual constructed images.

V^r Visual remembered (eidetic) images.

(Eyes defocused and unmoving also indicates visual accessing.)

A^C Auditory constructed sounds or words.

A^r Auditory remembered sounds or words.

K Kinesthetic feelings (also smell and taste).

A Auditory sounds or words.

Figure 1-2. Visual Accessing Cues For A Right-handed Person (1:25)

A person in the auditory processing mode will have her gaze at eye level, either side or down and to the left. Eyes level and to the right signify the construction of sounds or words. Eyes level and to the left signifies the remembering of sounds or words. Eyes down and to the left reflects sounds or words of either kind.

A person processing kinesthetically, that is, experiencing an inner tactile feeling, will have her eyes down and to the right.

Past Studies on the Eye Movement Theory

The validity of this portion of the model has yet to be proved by scientific experimentation. A few studies have addressed it, but to date the results have been mixed and inconclusive. Owens found significant agreement between the verbal predicate and eye movement method (16:75). Thomason, Arbuckle, and Cady found that questions designed to obligate the sensory process did not influence eye movements as hypothesized (17:230). Ellickson found no differences in perceived empathy, ease of communication, anxiety, or hostility when her interviewers determined PRS from eye movements and matched or mismatched perceptual predicates (6:101). Gumm, Walker, and Day found no significant relationship between eye movement and the other two methods of assessment (10:329). Falzett, on the other hand, found eye movements to be reliable indicators of PRS (7:308). These studies will be examined in further detail in later sections.

Statement of the Problem

The studies summarized above test different aspects of the eye movement theory but do not specifically address one issue. According

to NLP theory, eye movement does not always respond to the stimulus cues received. The eye movement itself indicates the representational system being utilized. To test this portion of the model, the eye movement must be detected first. Then it must be determined which representational system the subject was actually using. This portion of the model has not been directly tested, although Falzett approached it indirectly by matching predicates to eye movements, then by measuring the effects on perceived trustworthiness (7:306-308).

Importance of the Research

Bandler and Grinder have enjoyed great success with their Metamodel. According to Maron, it is currently being used professionally by growing numbers of therapists, counselors, organizational development specialists, lawyers, educators, and sales people (14:70). Claims of success by therapists using NLP applications are particularly impressive and will be detailed in a later section. This expanding use of NLP suggests that it is, or possibly could be, a major communications model. At this point, however, very little "systematic research into or evaluation of NLP treatment methods" or comparison of NLP with other methods has been done (12:453).

The matter is complicated because Bandler and Grinder do offer NLP as a model and not as a theory; they are, therefore, not at all disposed to testing it. They explain their position as follows:

> As modelers, we're not interested in whether what we offer you is true or not, whether it's accurate or whether it can be neurologically proven to be accurate, an actual representation of the world. We're only interested in what works (1:18).

The method does seem to be working for them. Transcripts from their workshops show Bandler and Grinder to be dynamic, charismatic, and extremely effective. In fact, one of the major problems in evaluating NLP is separating the effects of charisma from the effects of the model. That is, much of its reported success could be due to the personalities of the developers rather than to the effectiveness of their Meta-model (7:78). When their trainees go into the field (as of March, 1981, nearly 30,000 people had attended some form of NLP workshop), will they be able to achieve similar results given only their own personal abilities and the NLP model (11:449,453)?

The fact is, the model is being widely used by practitioners from many disciplines. These practitioners use the principles behind NLP and rely on its validity. If it is valid, the individual parts should be subject to proof through experimentation. If not, they should be reexamined.

The concept that eye movements predict the representational system used by an individual is only one portion of NLP theory; it is an important part, however, because it is widely used to access the rest of the Meta-model. If it were invalid or improperly applied, the use of the model would be hampered. Therefore, to verify the accuracy of the Meta-model, the predictive value of eye movements as indicators of representational systems must be tested.

II. Review of the Literature

Though the scope of this research is limited to eye movement and its relationship to representational systems, the nascent state of Neuro-Linguistic Programming as a communication model necessitates a brief description of its basic characteristics. The purpose of this literature review, then, is to provide the reader with a general understanding of NLP by discussing its origin, structure, applications, and limitations. The review will also include literature directly related to the eye movement/representational system hypothesis of this study.

NLP: Origins

As stated earlier, NLP evolved from Bandler and Grinder's systematic observation and analysis of communication patterns. After viewing video tapes and listening to audiotapes of Virginia Satir's counselling sessions, Bandler and Grinder found that these patterns could be documented.

Their observations led Bandler and Grinder to NLP's basic formulations, which they spelled out in two series of technical books, The Structure of Magic and Patterns of the Hypnotic Techniques of Milton Erickson, M.D.

> What they accomplished was to reduce to formulas--and a notational system borrowed from linguistics--how a person takes in sensory impressions, mentally organizes them in cognitive processes like memory and decision making, and then translates the sequence into response. They also reduce to models the way others respond (8:69).

The notational system reflects the influence of cybernetics and linguistic methods on the NLP model. One core concept, for example, is the "four-tuple," a notation that describes how a person represents

sensory experience at a given moment. The four-tuple notation codes visual activity as V, auditory activity as A, kinesthetic activity as K, and olfactory/gustatory activity as O (8:73).

According to Bandler and Grinder (2), the notational schema can be used to represent not just communication styles but also the habitual way in which a person performs almost any mental task. An example of the four-tuple is the formula derived by a student of Daniel Goleman (8) that represents Goleman's strategy for writing articles. The formula was derived after two to three hours of dialogue between Goleman and the student. It reads as follows:

$$Ad^{e}(V^{c}\ K\ V^{c}Ad\ K)E$$

> Translated, Ad means hearing or thinking about words, e means from an external source. V^{c} indicates a constructed visual image. K stands for feelings and E for an external act, such as writing (8:74).

Bandler and Grinder developed the system of packaging behavioral patterns in symbols as a way of structuring the NLP model for universal application. They saw this as a method of explicitly detailing communicative techniques, thereby lending organization and structure to the education of communicators and therapists. NLP is thus a set of workable techniques evolved from the structure of language (4) and the practice of therapy (Satir, Perls, and Erickson).

In the early 1970's, John Grinder was teaching linguistics at the University of California, Santa Cruz, and Richard Bandler was leading groups in Gestalt therapy (8:73). Their collaboration began when Bandler solicited Grinder's aid in an attempt to build models of effective therapy. They both had respected academic credentials. Bandler had been a mathematician before becoming a Gestalt therapist (8:66).

Grinder had co-authored a methodological classic, A Guide to Transformational Grammar, while a Green Beret in the pre-Vietnam era. He also developed the ability to mimic the body language as well as the speaking patterns of people from different regions. He later employed this ability in duplicating Bandler's skills as a therapist (8:73). Sharing the skills of therapist and linguist, Bandler and Grinder sought to develop a model of communication that could effectively expand and enrich their clients' perception of the world in which they live (2:7). John Grinder and Richard Bandler were later joined in their research by Bandler's wife, Leslie Cameron-Bandler, who is trained in psychology and counselling, and Judith DeLozier, whose background is religious studies (12:449).

Criticisms and Claims

Bandler, Grinder, and other proponents espouse NLP as a powerful tool for change, with very few limitations. However, criticisms of the NLP model also abound. They range from theoretical issues regarding its reliability and validity, to ethical questions concerning NLP's manipulatory nature in the salesmanship context.

Further research is warranted because of the fantastic claims by NLP practitioners alone. Their claim to immediate, effective change using NLP, suggests a dramatic improvement over current conventional means of therapy (14:68). Such a claim, if it held true, would of course lend economy and efficiency to a counselling situation. How quickly NLP works is characterized by the practitioner's ability to ascertain within minutes of a conversation the most likely way to reach a potential client and establish rapport (14:69).

The claims espoused by Bandler and Grinder appear indeed fantastic in light of conventional therapeutic techniques. John O. Stevens, a Gestalt therapist and former student of Abraham Maslow, in his foreword to Frogs into Princes (1), however, makes even bolder assertions. According to Stevens, through NLP, counselors can learn to accomplish the following among others:

1. Cure phobias and other unpleasant feeling responses in less than an hour.
2. Help children and adults with learning disabilities overcome those limitations, often in less than an hour.
3. Eliminate most unwanted habits - smoking, drinking, over-eating, insomnia, etc., in a few sessions.
4. Make changes in the interactions of couples, families and organizations so they function in ways that are more satisfying and productive.
5. Cure many physical problems - not only those recognized as "psychosomatic," but also some that are not - in a few sessions (1:ii).

Stevens admits that these are strong claims, but further asserts that "experienced NLP practitioners can back them up with solid, visible results" (1:ii).

NLP: The Meta-model

> There is an irreducible difference between the world and our experience of it. We as human beings do not operate directly on the world. Each of us creates a representation of the world in which we live - that is, we create a map or model which we use to generate our behavior (2:7).

Bandler and Grinder observed and extracted the specific set of tools implicit in the action of the master therapists (Perls, Satir, and Erickson). What they saw was that each of the masters had a map or model for changing their clients' models of the world - i.e., a Meta-model - which allowed their clients more options in their behavior (2:18). In The Structure of Magic, Bandler and Grinder sought to make this

Meta-model available to anyone who wishes to expand and enrich the skills they have as people-helpers (2:19).

The knowledge and application of the skills from the Meta-model are used throughout the practice of NLP (12:449). A brief discussion of it follows.

> When humans wish to communicate, they form a complete linguistic representation of their experience; this is called the Deep Structure. As they begin to speak, they make a series of choices (transformations) about the form in which they will communicate their experiences. The process of making this series of choices results in a Surface Structure (11:450).

According to Bandler and Grinder, conflict occurs when the Surface Structure does not accurately represent the Deep Structure. This problem can occur in the form of deletions, distortions, and generalizations, three important ingredients of the Meta-model (11:450).

Deletions are processes which remove portions of the original experience (2:59). They leave only pieces of the whole puzzle. An example of a deletion is the phrase "I'm lonely." Information as to whom or what the person is lonely for has been deleted.

Distortion refers to things which are represented in the client's model, but are twisted in some way which limits his ability to act and increases his potential for pain. Clients may demonstrate distortions of their experience through nominalization, representing an ongoing process (which can be changed) as if it were an unchangeable event. For example, a client may state, "I regret my decision to drop out of school." In reality, he or she can decide to drop out, decide to stay, or decide to return to school (12:450).

Generalization is one of the universal processes which humans use to create models of their experiences (2:80). In generalization, the

absence of detail can prevent the client from applying the appropriate choices in coping with a situation. "I'm a poor student," for example, may in reality translate to, "I have developed poor study habits." Until the client is able to cope with the reality that his study habits need improving, he simply expands a soluble situation into an insurmountable dilemma.

A fourth key element of the Meta-model is the use of representational systems. As mentioned earlier, we experience what is happening in the world through the senses, particularly seeing, hearing, and feeling.

> The NLP belief is that we store our experiences in these same systems. If we are primary auditory, that is, taking in through hearing, then it follows that we store information (memory) in the same system. If auditory persons want to access (remember) something, they most likely talk to themselves internally. In this same vein, visual people will create mental images or pictures when accessing information; kinesthetic people will experience a feeling (12:450).

According to Bandler and Grinder (2), people use all of their representational systems in communication, but each person has a preferred or primary representational system he employs most frequently in decision-making or other processes of distinction. As mentioned earlier, the matching or mismatching of representational systems can be very important in facilitator/client relationships.

Bandler and Grinder claim accessing cues are the means by which Neuro-Linguistic Programmers can identify their clients' preferred representational systems (PRS). These cues can be in the form of verbal predicates. Three examples are:

Client (kinesthetic): "I just don't grasp what you're saying. It seems out of my reach."
Client (visual): "I just don't see what you're saying. I guess I don't get the picture."
Client (auditory): "I just don't hear what you're saying. It doesn't sound right to me" (12:451).

The words underlined in the excerpt above are called process words. They help in identifying the various representational systems, and enable the facilitator to better access the system in use by the client. When this occurs, matching of representational systems takes place, improving rapport between facilitator and client.

Another method of determining the clients' preferred representational system is to watch the eye scanning patterns. The relationship between eye movement patterns and accessing information is explained in Chapter 1 (see Figure 1-2). That relationship is a key element of NLP's Meta-model and the primary focus of this study.

Eye Movement Studies

There have been a limited number of studies that have addressed the eye movement portion of the NLP model. Some have not measured eye movements as indicators of PRS directly, but have used the eye movements as cues, and have matched predicates accordingly. Investigators then measured effects this had on the facilitator client relationship. Studies of this type have had differing results.

Two studies wherein the facilitator matched predicates to the subjects' eye movements reached dissimilar conclusions as to the effects. Falzett measured perceived trustworthiness in a counselling analogue. He administered a questionnaire designed to access a specific sensory system, recorded the eye movements, then assigned matched or unmatched

predicates to be used during a subsequent interview. The treatment effect, the matching or not matching of predicates to subject PRS, was significant: $F = 31.37$, $p < .001$. He also found that eye movements tended to be more reliable than verbal predicates when assessing PRS (7:305-8).

Ellickson conducted a somewhat similar experiment but reached different conclusions. Her interviewers elicited eye movements by asking six questions, then matched similar or dissimilar predicates accordingly. She then measured subject's perception of interviewer empathy, ease of communication, anxiety, and hostility. There was no difference between effects of matching or mismatching predicates on any of the four dependent variables ($p = .341$) (6:101).

Other studies have directly examined eye movements as being predictive of PRS. These have also met with differing results.

Owens examined all three methods of assessing PRS for agreement between them. To test the method of listening to verbal predicates he asked three questions which asked for a narrative in reply. He then categorized and tabulated the verbal predicates. For testing of the eye movement portion he asked six questions and recorded and rated the subsequent eye movements for determination of the predominant movement. The final method, the self-report, asked the subjects how they primarily organized their internal reality (16:51-52). The results were tested against each other. Only the eye movement and listening to verbal predicate methods agreed significantly (Kappa value of 0.108, $p < .05$). Neither eye movements versus self-reports, nor self-reports versus listening to verbal predicates showed any significant agreement (16:75-78).

Gumm, Walker, and Day (9), in a study closely parallel to Owens', examined the similarities in the PRSs indicated by verbal report, eye movement, and self-report. Subjects were read a list of questions designed to provide a variety of cognitive tasks after which initial, or lead, eye movements were recorded. Verbal and self-reports were done separately. Where Owens found significant agreement between the eye movement and verbal report only, Gumm, Walker, and Day found no significant agreement between any of the methods (10:327-9).

Thomason, Arbuckle, and Cady induced eye movements in 40 subjects by questions which "required the subject to see mentally an image, hear a sound, or feel a tactile sensation." Their findings showed a significant discrepancy between what was expected and what was observed (chi-square = 1147.07, $p < .01$) (17:230). Beck and Beck rebut the findings of Thomason, Arbuckle, and Cady. They claim that although the experiment was well controlled, it misrepresented the model. According to Beck and Beck, the model "predicts that the eye movements reflect the internal processing system in actual use, normally the person's dominant or lead system, which may or may not relate to the specific stimulus." They propose that the proper test would involve the stimulus question, observation of the eye movements, and a further attempt by questioning to determine what the internal activity was during the thought process (3:2,4). This proposal formed the starting point for our research. By the design and experimentation that follow we apply that test to the NLP model.

III. Research Design and Methodology

An experiment consisting of directed interviews of 43 subjects tested this portion of the NLP model. The research design and methodology for the experiment were recommended by Beck and Beck in their article for Perceptual and Motor Skills (3:175-176). Two preliminary rounds of pretesting were conducted before the primary testing began. The following discussion describes (a) the hypotheses; (b) the selection of measurement variables; (c) the justification for the selected approach; (d) the experimental design; (e) the pretests; and (f) the experimental process.

Hypotheses

This research was designed to determine the degree of agreement between eye movement, verbal responses, and selection of categorized written descriptors as a function of representational systems. Eye movement and verbalization were behaviorally measured by quantifying responses to stimulus cues and categorizing the responses as auditory, visual, or kinesthetic (15:71). Descriptor selection was measured by tallying precategorized responses to the stimulus cues.

With the level of significance for rejection set at the .10 level, the following null hypotheses were examined:

H_o1: There will be no significant agreement between initial eye movement and verbal responses as indicators of representational systems.

H_o2: There will be no significant agreement between dominant eye movement and verbal responses as indicators of representational systems.

H_o3: There will be no significant agreement between initial eye movement and the selection of written descriptors as indicators of representational systems.

H_o4: There will be no significant agreement between dominant eye movement and the selection of written descriptors as indicators of representational systems.

H_o5: There will be no significant agreement between verbal responses and selection of written descriptors as indicators of representational systems.

The level of significance was set at .10 because of the nature of the study. The researchers deemed this level appropriate because the tests can measure the representational system used only indirectly, and cannot capture the actual thought processes. Some inaccuracy in measurement could thus occur and not necessarily be attributed to the model's validity.

Selection of Measurement Variables

The NLP model suggests that when individuals process information in either the auditory, kinesthetic, or visual sensory modes, incidental eye movement in a predictable direction occurs. The eye movements are dependent variables since they depend on the sensory processing mode, which is the independent variable.

However, there is no way to determine precisely someone's interior thought processes. Therefore, we can only measure indirectly by using the two tests we have devised: the selection of written descriptors and the choice of verbal responses. Both methods are employed since no universally acknowledged methods of discerning sensory modes exist.

The two tests produce two independent variables: verbal response and descriptor selection. If either of these prove to correlate with eye movement, initial or dominant, we may assume, given the limitations

of this study, that sensory processing modes correlate significantly with eye movements. A major limitation of the study is that the thought process must occur before the tests can be administered. Our results are constrained by our ability to reconstruct the thoughts of the individual through the two testing methods.

Justification for the Selected Approach

Researchers have met with varied results when using stimulus cues and responses to determine representational systems (6;10;17). This study was designed much like the study by Gumm, Walker, and Day (10), and the one by Thomason, Arbuckle, and Cady (17): Stimulus cues were used to initiate the interaction; observation of eye movements followed. This research diverged from the preceding studies with further questions designed to have the subjects identify their internal impressions experienced while thinking about the question (3:176). The purpose was not to determine a primary representational system for each subject, but merely to determine which representational system they were using at the time to access information.

Gumm, Walker, and Day read a list of "questions designed to provide the subject with a variety of cognitive tasks" (10:328). Eye movements were videotaped and a primary representational system was determined; they then compared the PRS to results of PRS determination tests using self-report (the subjects' own identification of the representational system), and verbal response (the subjects' use of auditory, visual, or kinesthetic verbal predicates in response to stimulus cues) (10:328). Thomason, Arbuckle, and Cady (17) used for stimulus cues questions which "required the subject to mentally see an image, hear a sound, or feel a

tactile sensation." The subjects' eye movements in response to each question were then recorded. Subjects were expected to make eye movements corresponding to the sensory modalities required by the stimulus question. A chi squared goodness-of-fit was calculated to determine correlation between the stimulus cues and eye movements (17:23). Neither study found significant positive correlation between the stimulus cues used and the eye movements observed.

The stimulus cues used in this experiment were not designed to prompt sensory specific (auditory, visual, or kinesthetic) responses and are not part of the cause-effect relationship that is being measured. The cues merely suggest a situation where auditory, visual, and kinesthetic effects are available, and allows the subjects to process the information in the sensory mode of their choice. The sensory mode used by the subject to process information is the causal element in the relationship. The eye movement is an incidental effect (incidental to the subject since it is of no use to him, but important to the observer who wishes to determine the representational system in use).

A third study, by Lee F. Owens, provided stimulus cues that were nonsensory specific and were not, therefore, designed to elicit a particular response mode. Owens scored eye movements that resulted from the cues and used his findings to determine the subjects' PRS. He then listened to verbal responses to the same cues and again determined the subjects' PRS, this time basing the PRS on subjects' use of verbal predicates representative of the three sensory modes (16:110-120). The two methods for determining PRS were then tested against each other for correlation.

Owens' design parallels this study in that the stimulus cues were designed to be non-sensory specific. This study differs, however, in that the PRS was not determined for each individual. The researchers in this study, after recording the subjects' eye movements, attempted to verify the representational system in use at the time the eye movements occurred. To accomplish this verification, we first presented the subjects with a menu of sensory specific written descriptors that contained responses to the stimulus cues in each of these categories: auditory, visual, or kinesthetic. The subjects' selections from these descriptors served as one method for identifying the representational system. The verbal predicates (process words) used by the subjects to describe the internal thought processes experienced during the initial stimulus cues provided the second method. Both methods for determining representational systems were individually tested for correlation against the observed eye movement.

Beck and Beck state that "the eye movement in the neuro-linguistic programming model is viewed not as a response to a stimulus but as an indication of the person's internal processing of information" (3:176). The approach undertaken in this study facilitates testing the eye movements' value as indicators of that internal processing.

Experimental Design

Three principal components constitute the design of this experiment: the selection of interviewer and subject, the development of stimulus cues and written descriptors used in the interview process, and finally, the selection of criteria for analysis.

Selection of Interviewer. One of the researchers acted as interviewer in this study. Use of a single interviewer approach minimized subject-interviewer bias. The interviewer used a script (see Appendix C) in order to standardize instructions. The prepackaged format of the stimulus cues did not necessitate the interviewer having previous counseling experience. The interviewer's prior knowledge of the Bandler and Grinder (2;9) model of representational systems and eye movement patterns should not have biased this study as the subjects' responses did not change the pattern of questioning in any way.

Selection of Subjects. Forty-five subjects were drawn from the graduate student population at the Air Force Institute of Technology (AFIT). Volunteers met the following criteria: they were (a) male; (b) right-handed; and (c) spoke English as a native language. A brief form (6) completed by the subjects provided this information to the researchers (see Appendix B). The all-male criterion was used to preclude any sex interaction bias (6:97). The selection of right-handed subjects followed on Bandler's and Grinder's (1) assertion that eye movements (visual accessing cues) as classified in the NLP model, pertain to normally organized (left brain dominant) right handers. Though Bandler and Grinder also assert that left handers' eyes move in opposite directions from those of right handers in response to the same stimulus (1:21), the characteristics of left handed NLP subjects are not further addressed in this study.

Before interviews began, subjects were informed that (a) they were participating in a graduate research project in interpersonal communication; (b) the interviews would be video taped; and (c) all responses

would be coded anonymously and kept confidential.

Determination of Stimulus Cues. The stimulus cues employed in this study were designed to elicit eye movements as the subjects either recalled past personal experiences related to the cues or mentally formed their own perception of such experiences.

As in the study conducted by Ellickson:

> All items are stated with non-specified predicates so that no predetermined direction of eye movement will occur thus leaving the subjects the freedom to access their experiences or perceptions in any of the representational systems. The decision to employ non-specified predicates is designed for the purpose of identifying the use of a primary representational system should it occur in subjects (6:69).

Six stimulus cues were used. This number was consistent with the number used by Ellickson and was preferred to the number (nine) employed by Owens (16). Owens later suggested using fewer cues so that subjects could have more time to discuss their experiences (16:93). Two of the cues were identical to those used by Ellickson. The other four were designed by the researchers. The content of the items was designed to elicit an extended search of memory. An extended search should require more eye movement than minimal search questions (Meskin and Singer, 1974, as reported by Ellickson, 1981) (6:69). To avoid arousing anxiety in subjects, all items were designed to be non-threatening. The stimulus cues are listed below:

1. I'd like you to think about experiencing a day at the beach (5:139).
2. I'd like you to think about your first car.
3. I'd like you to remember now your high school graduation (5:139).
4. I'd like you ro recall the last time you had your hair cut or styled.
5. I'd like you to think about your last visit to a shopping mall.
6. This is the last one. Think of a visit to an amusement park.

Determination of Written Descriptors. Beck and Beck assert that a proper test of the NLP model requires that observation of eye movement response to stimulus cues be followed by "an attempt (by further question) to have the subject describe the internal impressions experienced while thinking about the question" (3:176). The verbal responses to such questions would then act as verifiers of the representational system indicated by eye movement. In this study, written descriptors were used as additional verifiers. The descriptors were presented to the subjects in the form of printed menus of sensory specific (auditory, visual, and kinesthetic) predicates. A subject could select from these menus universally accepted descriptions of his responses to the stimulus cues. The written descriptors are listed below with the corresponding stimulus cues:

1. *Stimulus Cue:*

   I'd like you to think about experiencing a day at the beach.

   Descriptors:

   From this list select the three items that best relate to your experience.

(K) warm sand	(A) life guard whistles
(K) gentle breezes	(V) palm trees
(V) people walking	(V) bright sunlight
(A) roar of surf	(A) people talking
(K) cool water	

2. Stimulus Cue:

I'd like you to think about your first car.

Descriptors:

Again, from this list select the three items that best relate to your experience.

(V) paint job
(K) acceleration
(K) road handling
(A) stereo/radio
(K) seats
(V) body style
(A) engine sounds
(A) horn blaring
(V) panel indicators

3. Stimulus Cue:

I'd like you to remember now your high school graduation.

Descriptors:

Again, from the list, select three items that best relate to that experience.

(V) school colors
(A) procession music
(V) setting and decor
(K) embraces/handshakes
(A) call to receive diplomas
(A) speeches
(K) seating comfort
(K) wearing cap and gown
(V) line of graduates

4. Stimulus Cue:

I'd like you to recall the last time you had your hair cut or styled.

Descriptors:

Now, select three items that best relate to that experience.

(A) clippers buzzing
(K) combing hair
(K) seating comfort
(A) scissors snipping
(A) idle chatter
(V) magazine rack
(V) new haircut in mirror
(V) hair on the floor
(K) adjusting profile

5. Stimulus Cue:

I'd like you to think about your last visit to a shopping mall.

Descriptors:

From this list, select three items that best relate to that thought.

(V) display windows
(V) posters/marquees
(K) tired feet
(A) piped music
(V) architecture
(A) crowd chatter
(K) air conditioning
(A) public address announcements
(K) escalator rides

6. Stimulus Cue:

This is the last one. Think of a visit to an amusement park.

Descriptors:

Now, pick the three items that best relate to that thought.

(A) vendors shouting
(V) lights
(A) music
(K) vibration of rides
(V) carousels turning
(K) closeness of the crowd
(A) screams
(K) gentle breezes
(V) costumed figures

Each nine-item menu consisted of three auditory, visual, and kinesthetic type descriptors, and should have provided sufficient range of choice. Subjects were allowed to select not more than three descriptors from each menu in response to the corresponding stimulus cue. This number allowed the subjects to employ one descriptor from each category if desired, yet could also facilitate a more dominant sensory theme.

Criteria for Analysis. The final elements in the experimental design of this study are the Criteria for Analysis. To measure the level of agreement between the variables, a statistical analysis of the null hypotheses was done. The four variables in the study, initial eye

movement, dominant eye movement, verbal response, and selection of written descriptors, were represented as nominal data. The chi squared statistic was used to test for independence between the variables. Contingency tables were also used since there was multinomial count data classified on two dimensions (15:731). With the level of significance set at .10, five tables were constructed and tests were made of initial eye movement vs. verbal response, dominant eye movement vs. verbal response, initial eye movement vs. selection of written descriptors, dominant eye movement vs. selection of written descriptors, and verbal response vs. selection of written descriptors. The contingency tables correspond to the five null hypotheses.

Pretests

Actual testing was divided into two parts: pretests and the primary test. Pretests were conducted on both the written descriptors and the interview procedures.

Written Descriptors. To ensure that the sensory specific descriptors did in fact represent auditory, visual, and kinesthetic processing, 11 volunteers were asked to classify them as such. If more than one person disagreed with the majority on the classification of any particular descriptor, that descriptor was discarded and replaced, and the whole menu was tested against 11 more volunteers. All six menus and associated descriptors were tested accordingly.

Interview Procedures. Six volunteers were employed in a pretest of the interview procedures. The purpose of this pretest was to provide the researchers with information concerning average interview time,

facility and equipment conditions, and individual responses to the stimulus cues.

During pretesting, the interviewer verbally presented the first stimulus cue, allowed the subject several seconds to think about it, then asked him to verbalize his thoughts. Suggested time for the verbal response was 30 seconds, although some subjects responded much quicker and some took longer. The subject was then presented with the menu of descriptors (see Appendix D) and asked to select three. The procedure was repeated for the remaining five stimulus cues.

When this process was completed, the interviewer questioned each pretest participant about his responses to the stimulus cues and about the interview in general. It was then revealed that several of the participants, in selecting the written descriptors, had done so as a restatement of their verbal responses to the associated stimulus cue rather than as an independent, secondary method of responding to the cue. This finding prompted some necessary revisions to the interview procedure.

Revisions. In an attempt to minimize the aforementioned bias in the descriptor selection process, the researchers revised the interview format. The menus of written descriptors were presented before requests for the subjects' verbal responses to the stimulus cues. Also, the interviewer's script (see Appendix C) was rewritten to remind the subjects to relate both verbal responses and written descriptors to their initial thoughts that followed each stimulus cue.

Three new volunteers participated in a second round of pretests that included the revised interview format and script. The researchers were satisfied with the process.

Pretesting was also responsible for other important revisions to this study. After reviewing videotapes of pretest interviews, the researchers decided it necessary to distinguish between initial and dominant eye movements in evaluating the eye movement portion of the NLP model. This distinction was based on differences between initial and follow-on eye movements observed when subjects were presented the stimulus cues. To further assist the researchers in discerning initial and dominant eye movement differences, a stopwatch with elapsed time displayed to the 1/100 second was superimposed in the corner of the video screen. The watch was activated during each videotaped interview and was visible to the researchers as they observed each participant. The process of determining dominant eye movement is discussed later in this chapter.

Experimental Process

The actual experimental process is based on interview procedures as revised following the aforementioned pretests. The following discussion describes the subjects involved in this study and the scoring of their eye movements, verbal responses, and written descriptors.

Subjects. To ensure that the subjects were present and on time for the interviews, the researchers (a) personally contacted the subjects to arrange a suitable time and date; (b) placed written reminders in the subjects' mailboxes on the morning of the interview; (c) scheduled interviews 20 minutes apart to accommodate those arriving a few minutes early or late; and (d) arranged for personal escort of subjects from a waiting area to the interview room.

Prior to the interview process, the researchers discussed with the subjects the need for strict confidentiality concerning interview content, the guarantee of individual anonymity, and finally, the use of videotape equipment as an alternative to interviewer note taking.

Primary testing was completed during the week of April 17, 1984. Students who participated in the research project were sent a follow-up letter (see Appendix E) thanking them for their participation and describing the research project. Those who expressed further interest in NLP and the final results were later debriefed personally by the researchers.

Scoring the Eye Movements. Both researchers independently viewed the video tapes of eye movement response patterns and recorded their observations of each subject. To avoid bias, this scoring was first completed individually, before any of the verbal or written responses were observed or tallied. The researchers' prior knowledge of the NLP model should not have biased recording of the observations given this method of scoring. Consistency between the observers was important, however. Where disagreements occurred, the observers viewed the tape together. If they could not agree about any single response, that response was eliminated.

Careful scrutiny of the tapes clearly showed that the initial eye movement, which was sometimes of very short duration, frequently differed (16% of the time) from the dominant eye movement. The brevity of some of these initial eye movements also caused problems with the scoring. In some cases, the researchers were able to discern the initial eye movement only with the aid of sophisticated videotape equipment. The first

response was scored as the initial response, however, regardless of its duration.

To select the dominant eye movement, the researchers considered the initial eye movement and all other eye movements observed during the several seconds after the stimulus cue was presented. Approximately 15 seconds were allowed for processing, although most subjects indicated they were through within 5-7 seconds.

The researchers determined an eye movement dominant if it conformed to the guidelines in Figure 1-2 for auditory, kinesthetic, or visual response for more than 50% of the period of processing. If the processing period was determined to be evenly split between two responses or split between three so that no one response constituted more than 50% of the period (for example, 3 seconds, visual; 2.5 seconds, auditory; 1 second, kinesthetic), the response was considered to indicate no dominant eye movement and was eliminated. This happened in 15 instances, or less than 6% of the responses. The stopwatch was critical in determining dominant eye movement.

Only eye movements that could be classified with Figure 1-2 were used. In cases where the eye moved up but not clearly to the left or right, the movement was still scored as visual since movement up left and movement up right are both visual eye movements. When the eye movement was down, however, and the scorers were unable to call it left (auditory) or right (kinesthetic), the movement was discarded.

Determining what constituted a defocused (visual) eye movement was a challenge to the researchers. In many cases the subject seemed to be simply staring at the interviewer while processing his response to the

cue. This "defocused" response happened more often on the first two questions of each interview, before the subjects became familiar and more relaxed with the process. Rather than classify these ambiguous responses as true defocused (visual) eye movements, the researchers, with consensus, discarded them.

In some situations, when the subject may have closed his eyes or glare on eye glasses combined with camera angle prevented the differentiation of movement, the response was indiscernible. Responses that contained these problems were also eliminated. The rationale for these decisions was that in actual practice the person observing eye movements would simply reject an ambiguous or indiscernible cue and wait for a more identifiable one because there are almost continual eye movements to observe and evaluate. Eliminating some observations caused no problem in completing the research because the number of observations remaining for each statistical analysis was still more than adequate for the test being applied.

Scoring the Verbal Responses. Both researchers reviewed the videotapes independently to score verbal responses. Furthermore, reviewing the tapes for verbal responses was done at a different sitting than the review for eye movement. This measure was taken to avoid the unconscious influence of a subject's eye movements on the researchers' evaluation of that same subject's verbal responses.

Each researcher noted the predicates used by the subject and the context in which they were used. The researchers then formulated general impressions about the nature of the response and judged the response auditory, visual, or kinesthetic. The researchers agreed in the large

majority of cases. Where disagreement occurred, the tape was reviewed together and a consensus was reached. In a very few cases they were unable to agree and eliminated the response.

In some cases the verbal response from the subject contained non-sensory specific predicates or simply insufficient predicates for classification as auditory, visual, or kinesthetic. Some individuals simply had little to say about the stimulus cues. For example, "I got in, got my hair cut, and got out. That's all I remember." Additional prompts from the interviewer might have contained additional cues for an associated eye movement. Further prompts could thus have led to confusion about the subject's response. In such cases, the response was simply eliminated. These eliminations occurred 24 times (9% of total verbal responses evaluated). The remaining verbal responses constituted a number more than sufficient for the applied statistical test.

Very often, a subject's verbal response could not be represented by a single sensory mode category. The response may have been split between two modes, such as auditory and visual or visual and kinesthetic. To accommodate such a split, the portions of the verbal response that represented specific sensory modes were tallied as percentages of the overall single response. For example, if a single response contained elements of more than one sensory mode, it could have been scored as .667 auditory and .333 kinesthetic, for a total of 1.0 (a single response). Of the 235 verbal responses that were categorized, 65, or 28% were split between two or more sensory modes.

Scoring the Written Descriptors. After the written descriptors were obtained for each subject, the total response score was 1.0 for

each cue. Many divided their responses for each cue between the auditory, visual, and kinesthetic descriptors rather than selecting all of one sensory type. These were tallied as percentages as they actually occurred. For example, if a subject responded to a cue with two kinesthetic descriptors and one visual descriptor, the kinesthetic was accorded .667 and the visual .333 in the appropriate cells of the contingency tables. The combined percentages represent a total of 1.0 (a single response from each subject to each stimulus cue).

On occasion, a subject selected one or two items only. In this situation the chosen items were weighted more individually, but total was always 1.0. For example, if only one visual item was chosen the visual column in the tables was given 1.0. If two items (a kinesthetic and an auditory) were selected, each were scored .5.

After the written responses were tallied, but before any statistical testing was done, the researchers reviewed the totals on each question to see if a reasonable distribution existed among the descriptors. The three types of responses need not be equal because people may access information using one mode more than others.

The responses to cue number 5 were noticeably different from others, particularly in the distribution of the auditory responses. Of the 35 times subjects selected the auditory responses, 32 were for "idle chatter of crowd," 3 for "background music," and none for "announcements over the public address system." This distribution raised questions about the fair representation of auditory selections on the menu. For this reason, the descriptors for cue number 5 were eliminated from the calculations. In each case, the number of observations scored was still

more than adequate for the statistical tests that were applied.

Summary

This chapter presented the research design and methodology for a test of the neurolinguistic programming (NLP) model of human communication and behavior. Specifically, the experiment discussed herein provided insight into that portion of the NLP model dedicated to the predictive value of eye movements as indicators of representational systems.

Some important points covered in this chapter include: (a) the design and methodology of this study; (b) pretests related to the design and methodology; (c) revisions prompted by the results of pretesting; and (d) the actual experimental process, including revised methodology and the evaluation and scoring of variables related to the major hypotheses of this study.

IV. Findings and Analysis

The findings in this chapter are based on the research described in chapters I to III of this thesis in which 45 subjects were tested for correlation between eye movement, verbal responses, and the selection of written descriptors (in lieu of verbal report) as indicators of representational systems.

Research Description

The actual research methodology which produced these findings followed the design stated in Chapter III. Forty-three right handed, male, native English speaking subjects participated. A single interviewer was used to minimize subject-interviewer bias.

The videotaped sessions followed this procedure:

1. The first of six stimulus cues (Appendix C) was presented.
2. The subject was allowed approximately 15 seconds to contemplate a response, during which time eye movements were being recorded.
3. The subject was provided a written menu of descriptive phrases to choose from (Appendix D). The phrases were sensory specific and divided between auditory, visual, and kinesthetic verbal predicates.
4. After selecting three choices from the menu, the subject was asked to verbalize his initial thoughts.

This process continued for all six stimulus cues. The interviews averaged 12 minutes.

The researchers scored eye movements and verbal responses as auditory, visual, or kinesthetic, according to the NLP model. Selection of written descriptors was scored by tallying the sensory specific menu

items chosen by the subjects in response to the stimulus cues. All the null hypotheses were examined through statistical analysis. The results of each are presented in this chapter.

Statistical Tests

The research hypotheses were examined for significance using the chi squared contingency table analysis of the count data generated by this study. All tests used the 3 x 3 contingency tables.

In this analysis, the test statistic X^2 is used to compare observed and expected counts in each cell of the contingency tables. Large values of X^2 imply that observed and expected counts do not closely agree, and, therefore, that the hypothesis of independence is false. When data classifications are independent, the sampling distribution of X^2 is approximately a χ^2 (chi square) probability distribution (15:733). The significance level for rejection of all null hypotheses was set at the .10 level. The hypothesis of independence is thus rejected if $X^2 \geq \chi^2_{.10}$. Note: $\chi^2_{.10} = 7.77944$ for the test statistic X^2 when based on 3 x 3 contingency tables and 4 d.f. (15:899).

Statistical Analyses

As stated earlier, the four variables in the study, initial eye movement, dominant eye movement, verbal response, and selection of written descriptors, were represented as nominal data. The chi squared statistic was used to test for independence between these variables: initial eye movement against verbal response and against selection of written descriptors; dominant eye movement against verbal response and against selection of written descriptors; and finally, verbal response against selection of written descriptors.

Initial Eye Movement vs. Verbal Responses. A 3 x 3 chi squared analysis of the null hypothesis H_o1 which compares initial eye movement and verbal responses yielded a test statistic X^2 value of 1.8239. As this value was less than the chi squared probability distribution of 7.77944 at the .10 level, H_o1 was not rejected. This finding indicated that there was no significant agreement between initial eye movement and verbal responses as indicators of representational systems. Figure 4-1 represents the contingency table employed in the computation of test statistic X^2. Each cell in the table contains figures that represent the total number of individuals with corresponding cross-classifications of the variables. The second row of column 1,for example, represents 12 individuals with visual eye movements and auditory verbal responses.

Initial Eye Movement vs. Written Descriptors. A 3 x 3 chi squared analysis of the null hypothesis H_o2 comparing initial eye movement and the selection of written descriptors yielded a test statistic X^2 value of 0.8948. As this value was far less than the chi squared probability distribution of 7.77944 at the .10 level, H_o2 was not rejected. This finding indicated that there was no significant agreement between initial eye movement and the selection of written descriptors as indicators of representational systems.

The test statistic X^2 value in this hypothesis demonstrated very little agreement between the variables. Figure 4-2 represents the contingency table employed in the computation of X^2.

Dominant Eye Movement vs. Verbal Responses. A 3 x 3 chi squared analysis of the null hypothesis H_o3 comparing dominant eye movement and verbal responses yielded a test statistic X^2 value of 8.5385. This

H_o1: There will be no significant agreement between initial eye movement and verbal responses as indicators of representational systems.

Initial Eye Movement	Verbal Responses: A	V	K	Total
A	12	30	26	68
V	12	45	41	98
K	4	19	19	42
Total	28	94	86	N=208

A = Auditory

V = Visual

K = Kinesthetic

Figure 4-1. Contingency Table for Chi Square Test of Null Hypothesis 1. $X^2 = 1.8239$: H_o1 Not Rejected

$H_o 2$: There will be no significant agreement between initial eye movement and the selection of written descriptors as indicators of representational systems

Written Descriptors

Initial Eye Movement	A	V	K	Total
A	24	32	19	75
V	32	42	31	105
K	14	20	10	44
Total	70	94	60	N=224

A = Auditory

V = Visual

K = Kinesthetic

Figure 4-2. Contingency Table for $_2$Chi Square Test of Null Hypothesis 2. $X^2 = 0.8948$: $H_o 2$ Not Rejected

value exceeded the chi squared probability distribution of 7.77944 at the .10 level. Therefore, H_o3 was rejected. This finding indicated that there was a significant agreement between dominant eye movements and verbal responses as indicators of representational systems.

The test statistic X^2 value in this hypothesis demonstrated a substantial degree of agreement between the variables. Chapter V explains the implications of this finding. Figure 4-3 represents the contingency table employed in the computation of X^2.

Dominant Eye Movement vs. Written Descriptors. A 3 x 3 chi squared analysis of the null hypothesis H_o4 comparing dominant eye movement and the selection of written descriptors as indicators of representational systems yielded a test statistic X^2 value of 0.8329. This value was far less than the chi squared probability distribution of 7.77944 at the .10 level. Therefore, H_o4 was not rejected. This finding indicated that there was no significant agreement between dominant eye movement and the selection of written descriptors as indicators of representational systems.

The test statistic X^2 in this hypothesis demonstrated very little agreement between the variables. Figure 4-4 represents the contingency table employed in the computation of X^2.

Verbal Responses vs. Written Descriptors. A 3 x 3 chi squared analysis of the null hypothesis H_o5 comparing verbal responses and the selection of written descriptors yielded a test statistic X^2 value of 6.1897. As this value was less than the chi squared probability distribution of 7.77944 at the .10 level, H_o5 was not rejected. This finding indicated that there was no significant agreement between verbal

H_o3: There will be no significant agreement between dominant eye movement and verbal responses as indicators of representational systems

Verbal Responses

Dominant Eye Movement	A	V	K	Total
A	14	24	19	57
V	8	38	41	87
K	4	21	18	43
Total	26	83	78	N=187

A = Auditory

V = Visual

K = Kinesthetic

Figure 4-3. Contingency Table for Chi Square Test of Null Hypothesis 3. $X^2 = 8.5385$: H_o3 Rejected

H_o4: There will be no significant agreement between dominant eye movement and the selection of written descriptors as indicators of representational systems.

Dominant Eye Movement \ Written Descriptors	A	V	K	Total
A	18	16	14	48
V	28	31	26	85
K	9	13	9	31
Total	55	60	49	N=164

A = Auditory

V = Visual

K = Kinesthetic

Figure 4-4. Contingency Table for Chi Square Test of Null Hypothesis 4. $X^2 = 0.8329$: H_o4 Not Rejected

responses and the selection of written descriptors as indicators of representational systems.

The test statistic X^2 value in this hypothesis demonstrated substantial agreement between the variables, although not quite significant at the .10 level. The implications of this finding will be discussed in Chapter V. Figure 4-5 represents the contingency table employed in the computation of X^2.

In addition to findings related directly to the hypotheses tested, Figure 4-6 reports the distribution of response categories by sensory mode. The total of 415 visual responses represented 45% of all responses recorded during this study. Auditory and kinesthetic responses each accounted for 27%. This distribution was generally consistent across the individual response categories. One noticeable exception, however, occurred in the verbal response patterns. There, the 30 auditory responses accounted for only 13% of the total of 234, while kinesthetic responses represented 41%.

In addition, some slight differences were noted between the individual subjects' initial and dominant eye movements in response to the same stimulus cues. Of the 75 initial eye movements categorized as auditory, 13 (17%) were followed by dominant eye movements categorized as either visual or kinesthetic. Of the 107 initial eye movements categorized as visual, 16 (15%) were followed by dominant eye movements categorized as either auditory or kinesthetic. Finally, of the 44 initial eye movements categorized as kinesthetic, 3 (7%) were followed by dominant eye movements categorized as either auditory or visual in response to the same stimulus cue.

H_o5: There will be no significant agreement between verbal responses and the selection of written descriptors as indicators of representational systems

Written Descriptors

Verbal Response	A	V	K	Total
A	12	9	8	29
V	26	43	22	91
K	32	28	30	90
Total	70	80	60	N=210

A = Auditory

V = Visual

K = Kinesthetic

Figure 4-5. Contingency Table for Chi Square Test of Null Hypothesis 5. $X^2 = 6.1897$: H_o5 Not Rejected

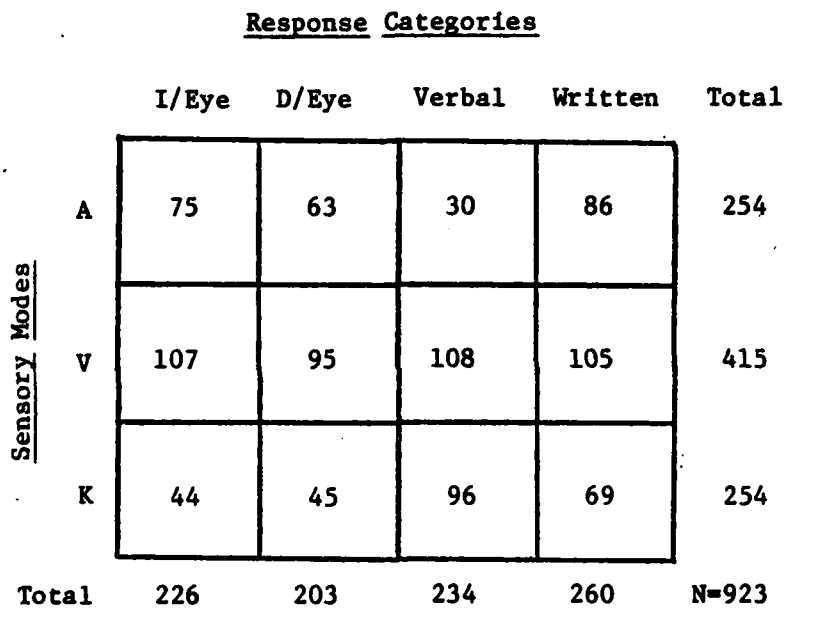


Figure 4-6. Distribution of Response Categories by Sensory Modes

Summary

The results of statistical analyses conducted on the null hypotheses of this study were presented in this chapter. Of the five hypotheses tested, only the one which was tested for agreement between dominant eye movement and verbal response as indicators of representational systems showed significant agreement. The implications of this finding will be discussed in Chapter V.

The null hypothesis which was tested for agreement between initial eye movement and verbal response as indicators of representational systems found no significant agreement. The null hypothesis which was tested for initial eye movement versus the selection of written descriptors also indicated no significant agreement. Again, the null hypothesis which was tested for agreement between dominant eye movement and the selection of written descriptors indicated no significant agreement between the variables as indicators of representational systems. Finally, the null hypothesis which was tested for agreement between verbal response and the selection of written descriptors also indicated that there was no significant agreement. It was noted, however, that the relatively high value for the test statistic X^2 indicated, in this case, a substantial, though not quite statistically significant agreement. The implications of this finding will also be discussed in Chapter V.

V. Significance of Results, Practical Implications, and Recommendations

Significance of the Results

The part of this study that reached statistical significance, dominant eye movement vs. verbalization, lends some credibility to that portion of NLP theory that claims that eye movement is an indicator of representational system. The results agree somewhat with Lee F. Owens who found a significant agreement between eye movement and verbalizations (16:75). While this agreement is noteworthy, it is important to point out that Owens used eye movements to determine a pattern (a primary representational system in each person) and then related this system to a pattern of verbalizations to test for significance. This study investigated the more basic premise that eye movements indicate the system in use at that time.

A major reason for testing verbal responses against the selection of written descriptors was to compare the two methods used to test the hypotheses. When this testing was done, the result failed to reach statistical significance at the .10 level although the test statistic of 6.1897 approached the chi square probability of 7.7794. The other two tests involving the selection of written descriptors demonstrated very little agreement between the variables. In each case, the test statistic was less than 0.9. Since the verbal response technique reached significance in one case, some doubt exists as to whether the selection of written descriptors was an adequate method of testing. Perhaps by using a more effective method one of those two tests may have reached statistical significance. Suggestions for improving this method

are included later in this chapter.

The lack of statistical significance of initial eye movements vs. verbal responses when compared to the statistical significance of dominant eye movement vs. verbal response could be important in further understanding the NLP model. The disagreement indicates that the categorization of eye movements can be a complex issue. In many cases there is not a singular movement but a series of movements.

One possible explanation for lack of agreement was provided in a 1977 workshop held by John Grinder and Judith DeLozier (as reported by Owens).

> Certain individuals have a lead system as well as a primary representational system. This lead system is a totally unconscious one which provides for accessing information and transforming it into a second eye movement with verbalizations matching the second eye movement (16:54).

Whether initial eye movements are usable at all in determining representational systems is an issue that is not yet resolved.

Practical Implications

The findings of this study present some practical implications that must also be addressed, in particular, the finding of significant agreement between dominant eye movement and verbal response as indicators of representational systems. This finding, in conjunction with the finding of no correlation in either hypothesis which presented initial eye movement as an independent variable, suggests that dominant eye movement is a more reliable indicator of the representational system in use than initial eye movement. In a counseling context, this finding can have considerable practical value.

The facilitator, in attempting to establish rapport with a subject, may be more likely to do so by observing the subject's dominant eye movement while listening to the verbal predicates being used. The combination of these two methods may indicate the representational system used by the subject on that particular instance. According to Grinder and Bandler, the facilitator can then adjust and match systems, which will enhance communication between facilitator and client and allow the other portions of the model to be applied.

This study supports the concept of representational systems. Findings, however, suggest caution in the use of the eye movement method alone when determining representational systems. Though the null hypothesis which examined agreement between dominant eye movement and verbal response was rejected and thus showed statistical significance at the .10 level, it should be noted that there was not overwhelming agreement between the two variables. In fact, when tested at the .05 level of significance, this hypothesis was not rejected. This finding indicated no significant agreement between dominant eye movement and verbal response as indicators of representational systems at the .05 level. As agreement of these variables was of statistical significance at the .10 level, further investigation of the hypothesis is merited. Lack of agreement at the .05 level, however, raises questions about the practical significance of that same hypothesis and thus suggests that viewing eye movements may not yet be able to stand alone in determining representational system.

Lee F. Owens, in his recommendations for revision of a study investigating eye movements and representational systems, suggested the use

of video tape for verifying or rating eye movement (16:94). Such equipment was used in this study. To discern clearly initial and dominant eye movement of the subjects interviewed, the researchers required that a timer measuring accurately to the hundredth of a second be superimposed on the screen image of each subject. The tapes also required repeated viewing before the eye movement could be determined precisely. The researchers agreed that without the use of the video tape and timer, the task of gathering data for this study would have been insurmountable. In many subjects, initial eye movement was so swift that it could not be seen with the naked eye. The necessity of video equipment in an experimental context raises questions about the ability of a facilitator to discern initial eye movement accurately in a practical setting. This finding supports the earlier statement that dominant eye movement may be a more reliable indicator of a representational system in use than initial eye movement. The researchers agreed that a subject's dominant eye movement could be discerned to some degree of accuracy with the naked eye.

Recommendations for Revision of this Study

The majority of the research procedures used in this study were of original design, and many lessons were learned in the process. Based on these insights, the researchers offer the following recommendations for improving the study should it be repeated:

1. Include a practice or "warm up" stimulus cue. Subjects frequently stared at the interviewer after the first stimulus cue because they seemed unsure of what they were supposed to be doing. Also, some of the verbal responses were initially abrupt, or tentative. Once

subjects became familiar and more comfortable with the process, eye movements and responses were more spontaneous.

2. Test one group of subjects using verbal responses; test another using the selection of written descriptors as indicators of representational systems. The presentation of one method first may have influenced the other method slightly. Testing 20 subjects using each method would still allow the number of observations to be more than adequate in every situation.

3. Revise the written descriptors to include more actual predicates. For example, the descriptors in the first question might have included "feeling the warm sand" (kinesthetic), "seeing the people walking" (visual), or "hearing the roar of the surf" (auditory). This would put more emphasis on the sensory modes, the feeling, seeing, and hearing, rather than on incidental items such as sand, people, and surf.

4. Ask that on the menu of written descriptors, the subjects rank order the selections so a system could be devised to weigh the strongest recollections more. Some subjects seemed to grope for the third choice, or made comments like "I remember a lot of this, some of this one, and a little bit of this." A system of weighting the higher ranked selection would accord the more dominant selection the proper emphasis.

Recommendations for Follow-on Studies

As stated earlier, significant agreement existed between dominant eye movement and verbal response as indicators of representational systems. This finding supports the concept of representational systems. Further research in this area is necessary however, before an adequate evaluation of that concept can be made. The following are specific

recommendations for further research in the area of representational systems:

1. Conduct further research in the area of two-step processing in response to stimulus cues. A study of individual response patterns to determine whether experiences are accessed in one modality and processed in another might provide some insight into differences between initial and secondary or dominant eye movement.

2. Examine those individuals whose dominant eye movements differ from their verbal responses. Such a study might yield information on internal transformation processes or a common pattern of personality variables (16:92).

3. Investigate the assertion that left handers have visual accessing cues that are reversed left to right from those of "normally organized" right handed people. No references were found in the literature to any study involving left handers. Findings from such a study could provide added information as to the predictive value of observing eye movements.

Appendix A: Solicitation Letter

13 April 1984

Hello,

We need 40 men who are willing to participate in a Communications research project in support of an AFIT Masters thesis. Participation is limited to men who are (1) right-handed, and (2) speak English as a native language.

Participation should take no more than 20 minutes of your time. It will consist of a structured, videotaped interview where you will be asked to recall some past experiences. Nothing of a personal nature will be asked, nor will your responses be associated with your name after the testing is over.

The project will be run during the week of 23-27 April 1984, from 1300-1700 in room 119, bldg. 641, Area B, Wright-Patterson AFB, Ohio. If you are interested, please sign your name and phone number so we can set up an interview time.

If you have any questions, contact Bill Moore at 236-5444, Gregg Powell at 236-5395, or me at 255-2820. *Thank you.*

Sincerely,

Freda F. Stohrer
Associate Professor of Technical Communication
Department of Communication

Appendix B: Information Form

Thank you for participating in this study. Before beginning, we would like some information from you that is important to this research effort. All information will be kept strictly confidential. Please take a few minutes to complete the form.

NAME: _____ AGE: _____

Which hand do you write with? (Please circle)

right left

Which hand do you use for most activities? (Please circle)

right left both evenly

Is English the first language you learned to speak as a child?

(Please circle). Yes No

If not, what language did you learn first? _____

Thank you for your cooperation.

Appendix C: Script

Hi. I'm Capt Bill Moore, I'll be conducting the interview with you this morning/afternoon. We will be videotaping the interview so we don't miss anything. First, I want to put you at ease and explain a little bit about what we are doing. I will be asking you to recall some experiences you may have had in the past, or to imagine them. I'll give you the situation, have you think about it for a few seconds, then have you select from a printed list the three items that come closest to your recollections. After you've done that I'll ask you to describe for about 30 seconds those initial thoughts that came to your mind after I asked the question and before you made your selections. Be sure to concentrate on the initial thoughts and not about what was on the menu.

Your answers will be kept strictly confidential and nothing you say will be associated with you in particular. There are no right or wrong answers so don't be concerned about that. We just want to know what some peoples' responses are to these questions.

Do you have any questions or problems before we get started? Great. Then we'll get started. Here's the first question.

1. I'd like you to think about experiencing a day at the beach.

From this list select the three items that best relate to your experience.

Now briefly describe your thoughts. Remember to concentrate only on those initial thoughts.

2. I'd like you to think about your first car.

Again, from this list select the three items that best relate to your experience.

Now go back and describe those initial thoughts.

3. I'd like you to recall now your high school graduation.

Again, from the list, select three items that best relate to that experience.

Now briefly describe those initial thoughts.

4. I'd like you to think about your last visit to a barber shop or hair stylist.

Now select three items that best relate to that experience.

Now briefly describe those thoughts. Remember, just those initial thoughts.

5. I'd like you to think about your last visit to a shopping mall.

Again, from the list select three items that best relate to those thoughts.

Now briefly describe those initial thoughts.

6. This is the last one. Think of a visit to an amusement park.

Now pick three items that best relate to that thought.

Again, describe the initial thoughts.

That does it for the questions. We sure appreciate you taking the time to help us out. There will be other people from the class that will be interviewed later, so if you would, please don't discuss or mention the specific questions to them before this week is over.

Thanks a lot.

Appendix D: Menu of Written Descriptors

1 CHECK THREE

____ PEOPLE WALKING IN THE DISTANCE
____ WARM SAND UNDER YOUR FEET
____ COOL WATER AGAINST YOUR SKIN
____ ROAR OF THE SURF AGAINST SHORE
____ GENTLE BREEZES
____ RADIOS PLAYING
____ ASSORTED CONVERSATIONS
____ BOATS ON THE HORIZON
____ PALM TREES

2 CHECK THREE

____ HORN SOUNDING
____ STEREO/RADIO
____ SOFTNESS OF SEATS
____ BODY STYLING
____ FORCE OF ACCELERATION
____ HEATER/AIR CONDITIONER
____ PANEL INDICATORS
____ COLORS OF INTERIOR/EXTERIOR
____ SOUND OF MOTOR REVVING

3 CHECK THREE

____ EMBRACES/HANDSHAKES
____ PROCESSION MUSIC
____ GRASPING OF DIPLOMA IN HAND
____ CALL TO GRADUATES
____ SETTING AND DECOR
____ LINE OF GRADUATES IN CAPS AND GOWNS
____ SCHOOL COLORS DISPLAYED
____ APPLAUSE FROM THE AUDIENCE
____ SEATING COMFORT/DISCOMFORT

4 CHECK THREE

____ MAGAZINE RACK OR DISPLAY

____ CLIPPERS BUZZING IN YOUR EAR

____ GETTING YOUR HAIR COMBED

____ SOUND OF SCISSORS SNIPPING

____ CASH REGISTER RINGING

____ GOOSE BUMPS

____ HAIR ON THE FLOOR

____ SIGHT OF THE NEW HAIRCUT IN MIRROR

____ SEAT ADJUSTMENTS

5. CHECK THREE

____ BACKGROUND MUSIC

____ RIDING THE ESCALATOR

____ ANNOUNCEMENTS OVER PUBLIC ADDRESS SYSTEM

____ RIDING THE ELEVATORS

____ DISPLAY WINDOWS

____ POSTERS/MARQUEES

____ ARCHITECTURE OF THE MALL

____ IDLE CHATTER OF CROWD

____ AIR CONDITIONING/OPEN-AIR BREEZES

6. CHECK THREE

____ VIBRATION OF THE RIDES

____ SCREAMS

____ PERSPIRATION

____ GENTLE BREEZES

____ DISPLAY OF PRIZES

____ SOUND OF MACHINERY IN MOTION

____ BRIGHT LIGHTS

____ CAROUSEL MUSIC

____ BALLOONS ON STRINGS

Appendix E: Letter of Appreciation

Dear

We would like to express our sincere appreciation for your contribution of time and effort towards the successful completion of our study, Neuro-Linguistic Programming: A Communication Model.

The study forms the basis for our graduate thesis work here at AFIT. It evolves from the work of John Grinder, a noted linguist, and Richard Bandler, a Gestalt therapist, who both envisioned communication and the way people process information as having a structure and therefore capable of being modeled.

The model is based on the notion that people have primary sensory systems (either auditory, visual, or kinesthetic) that they use when processing information and communicating. When a person says "I hear what you're saying" they may be processing auditorily, while another may say "I see what you mean" and be processing visually. In other words, these are not necessarily figures of speech, but the person may be literally hearing or visualizing internally.

The reason this is important is that if another person can recognize the sensory system and match it, studies have shown that rapport and communication is greatly enhanced. This has been used widely in therapy, education, and counseling, with great success.

Bandler and Grinder found through years of observation that by watching the eye movements of people as they process information the other person (therapist, teacher, spouse, etc.) can determine which sensory mode they are using. This model has and is being used but has never been proven or disproven in scientific testing. By evoking thoughts of situations, scoring eye movements, and correlating them to verbal and written responses, we are attempting to test this portion of the Neuro-Linguistic Programming model.

Again, your valued assistance in this study is much appreciated.

Capt Bill Moore
Lt Gregg Powell

Bibliography

1. Bandler, Richard, and John Grinder, Frogs into Princes. Moab UT: Real People Press, 1979.

2. Bandler, Richard, and John Grinder, The Structure of Magic. Palo Alto CA: Science and Behavior Books, 1975.

3. Beck, Charles E., and Elizabeth A. Beck, "Test of the Eye Movement Hypothesis of Neurolinguistic Programming: A Rebuttal of Conclusions," Perceptual and Motor Skills, 58: 175-176 (February 1984).

4. Chomsky, Noam, Aspects of the Theory of Syntax. Cambridge MA: MIT Press, 1965.

5. Dowd, E. Thomas, and John Pety, "Effect of Counselor Predicate Matching on Perceived Social Influence and Client Satisfaction," Journal of Counseling Psychology, 29: 206-209 (March 1982).

6. Ellickson, Judy, "The Effects of Interviewers Responding Differentially to Subjects' Representational Systems as Indicated by Eye Movements," Unpublished Doctoral Dissertation, Michigan State University, Lansing MI, 1981.

7. Falzett, William C. Jr., "Matched Versus Unmatched Primary Representational Systems and Their Relationship to Perceived Trustworthiness in a Counseling Analogue." Journal of Counseling Psychology, 28 (4): 305,308 (July 1981).

8. Goleman, Daniel, "People Who Read People," Psychology Today, 13: 66-78 (July 1979).

9. Grinder, John, and Richard Bandler. The Structure of Magic II. Palo Alto CA: Science and Behavior Books, 1976.

10. Gumm, W. B., M. K. Walker, and H. D. Day, "Neurolinguistics Programming: Method or Myth?" Journal of Counseling Psychology, 29 (3): 327-330 (May 1982).

11. Hammer, Allen L., "Matching Perceptual Predicates: Effect on Perceived Empathy in a Counseling Analogue," Journal of Counseling Psychology, 30 (2): 172-179 (April 1983).

12. Harman, Robert L., and Charles O. O'Neill, "Neurolinguistic Programming for Counselors," The Personnel and Guidance Journal, 59: 449-453 (March 1981).

13. Lankton, Steve. Practical Magic. Cupertino CA: Meta Publications, 1980.

14. Maron, Davida, "Neurolinguistic Programming: The Answer to Change? " Training and Development Journal, 33: 68-71 (October 1979).

15. McClave, James T., and P. George Benson, Statistics for Business and Economics, San Francisco and Santa Clara CA: Dellen Publishing Co., 1982.

16. Owens, Lee F., "An Investigation of Eye Movements and Representational Systems," Unpublished Doctoral Dissertation, Ball State University, Muncie IN: July 1977.

17. Thomason, Timothy C., Terry Arbuckle, and Daniel Cady, "Test of the Eye Movement Hypothesis of Neurolinguistic Programming," Perceptual and Motor Skills, 51: 230 (April 1980).

VITA

Captain William H. Moore was born on 22 October 1949. He graduated from high school in Detroit, Michigan in 1967 and enlisted in the U.S. Air Force in November 1969. While on active duty, he attended Officer Training School and was commissioned in October 1973. After serving as Security Police Officer in the 379th Security Police Squadron, Wurtsmith AFB, MI, he attended navigator training at Mather AFB, CA and received his wings in December 1975. He served as navigator and instructor navigator in the 912th Air Refueling Squadron, Robins AFB, GA, and the 917th Air Refueling Squadron, Dyess AFB, TX. He received the degree of Master of Science in Management and Human Relations from Abilene Christian University in May 1983, and entered the School of Systems and Logistics, Air Force Institute of Technology, also in May 1983.

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VITA

Lieutenant Gregory A. Powell was born on 1 October 1953 in Riviera Beach, Florida. He graduated from the Peddie School, Hightstown, New Jersey in 1971. After two years at Northeastern University, he enlisted in the U.S. Air Force in September 1973. While on active duty he attended Officer Training School and was commissioned in November 1980. He has served as Chief, Accounting and Finance Branch, 410th Bombardment Wing, K.I. Sawyer AFB, Michigan. His overseas tours include Osan AB, South Korea and Clark AB, Republic of Philippines. Lieutenant Powell received the degree of Bachelor of Arts in Social Psychology from Park College in June 1979, and entered the School of Systems and Logistics, Air Force Institute of Technology in May 1983.

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Thesis Chairman: Dr. Freda F. Stohrer

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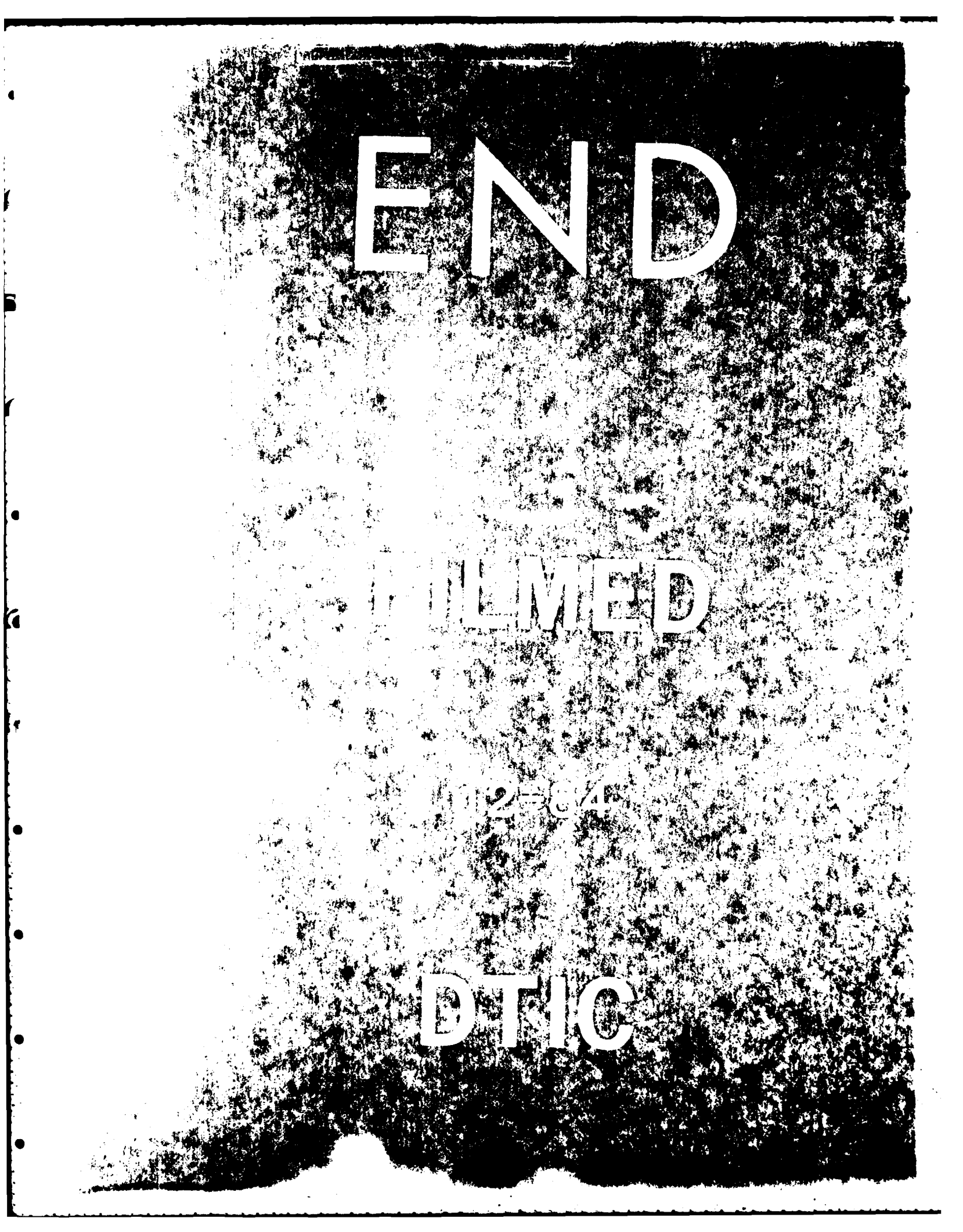
The experiment documented in this thesis investigated the eye movement hypothesis of the Neuro-Linguistic Programming model by testing the initial and dominant eye movements of forty-three male, right handed subjects against two methods of determining representational systems: the categorization of verbal responses and the selection of written descriptors, both in response to stimulus cues. Chi squared contingency tables were used to test dependency.

Neuro-Linguistic Programming was developed by Richard Bandler and John Grinder. It is a model of human communications and behavior which claims that people organize and access information using representational systems. These systems are based on sensory modes, primarily auditory, visual, and kinesthetic. According to the model, specific eye movements are associated with, and are indicators of these representational systems.

In this study, verbal responses were found to be dependent upon dominant eye movement, statistically significant to the .10 level ($\chi^2 = 8.5385$, 4d.f.). No correlation was found between dominant eye movement and the selection of written descriptors or between initial eye movements and either verbal response or descriptor selection.

The results of this study lend some credibility to the assertion that eye movements are indicators of representational systems, but suggest caution in the use of the eye movement method alone because of the lack of overwhelming agreement between the variables tested. Also, the fact that initial eye movements did not reach statistical significance as indicators in either test while dominant eye movements did reach significance, revealed an unanticipated complexity in the assessment of eye movements. Finally, the need for sophisticated audio-visual equipment to properly discern eye movements, particularly initial ones, questions the ability of facilitators to discriminate eye movements consistently and accurately in a practical setting.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